UNIT 5: DATA MODELLING

Delivery guidance

Approaching the unit

This internally assessed unit has been designed to give learners opportunities to explore the role that data modelling plays in the decision-making processes of businesses and organisations. Learners will need to use analytical thinking to analyse the various factors that affect a given scenario in order to develop a data modelling solution that will allow a client to consider a range of possibilities and make an informed decision.

This delivery guide does not cover everything that needs to be delivered for completion of this unit but gives examples of delivery methods. You should refer to the specification for full details of all the content that needs to be covered.

Delivering the learning aims

For learning aim A you could start by introducing some of the concepts of the project lifecycle, including considering how this includes stages of the decision-making process (A1) throughout a project. You should then give learners opportunities to explore the use of data modelling in a range of vocational scenarios. This could be achieved by a combination of case studies, visits, guest speakers and individual research into a wide range of businesses and organisations.

As well as ensuring that learners understand the general uses of data modelling in a theoretical manner, you should equip them with a range of practical data modelling skills and create opportunities for them to use, evaluate and develop a range of effective (and not so effective) models for different scenarios. Ask learners to consider other scenarios at a more granular level, considering how specific features of a data model impact on the decision-making process and the accuracy and effectiveness of the final decision.

To complete learning aim B, you should ask learners to demonstrate a number of practical project planning and management skills. When preparing for the assignment, you should ensure that learners are familiar with producing appropriate planning documentation that is clear and detailed, and that they are familiar with effective methods of communicating with others to seek and record feedback in order to refine ideas.

In order to produce effective designs, learners will need a solid grasp of the features and limitations of data modelling software. Therefore, before starting the assignment, ensure that they have a good understanding of how to use data modelling software. Allow time for learners to experiment with creating and developing complex data models to meet identified needs and make decisions, in a range of realistic, vocational scenarios.

For learning aim C, learners will need to develop the practical skills listed in the specification (C1) in a range of realistic vocational scenarios. You should ensure that learners have a good understanding of selecting and applying different testing methods, creating and completing test documentation and working with others to review and refine data models. Learners should be able to apply and select testing methodologies that test the functional and acceptance

characteristics of a data model that they produce, and be able to review them against the required outcomes of a project.

Give learners opportunities to work with others to identify working parameters, success criteria and to review outcomes. It is important that learners can demonstrate that the can apply all skills in a realistic project environment. When delivering the content, it would benefit learners to engage with local professionals. You could organise guest speakers to give an insight into how modelling is used in larger projects or to show learners examples and case studies relating to the project management skills and decision-making processes required in the computing industry.

Throughout their practical work, learners should be encouraged to keep a diary, in which they can keep a record of their progress, any issues they encountered and how they overcame them. This will be valuable when writing the evaluation and reflecting on their own performance as part of the second assignment.

High quality and accurate verbal and written communication skills are vital for progressing in higher education and in employment. As such, ensure that learners are confident in presenting thoughts and ideas to others, as well as producing well-presented, accurate and appropriate documentation for all stages of a project. Demonstrate techniques to learners to help them effectively evaluate the success of a project and the factors that contributed to the final outcomes, including their own skill, knowledge and behaviours.

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Learning aim	Key content areas	Recommended assessment approach
A Investigate data modelling and how it can be used in the decision-making process.	**A1** Stages in the decision-making process **A2** Spreadsheet features used to support data modelling **A3** Using data modelling to consider alternatives **A4** Evaluating models **A5** Documenting and justifying decisions	A presentation or report evaluating the role of data modelling in the decision-making process.
B Design a data model to meet client requirements	**B1** Functional specification **B2** Spreadsheet model design **B3** Reviewing and refining designs	A practical activity, involving the design and development of a data model to fulfil identified client requirements. A functional specification, design documentation, spreadsheet development and testing logs. A report that evaluates the effectiveness of the alternatives considered and suggests ways in which the alternatives could be improved if the task were to be repeated.
C Develop a data model to meet client requirements	**C1** Developing a data model solution **C2** Testing the data model solution **C3** Reviewing and refining the data model solution **C4** Skills, knowledge and behaviours	

Assessment guidance

This is an internally assessed unit and learners will need to complete internally devised and marked assignments to cover the learning aims. Learning aim A is essentially theoretical in nature and the assignment should be made practical by basing it around a vocational case study preferably for a real organisation. If there is an opportunity to involve an employer in helping to develop the brief then learners will clearly benefit.

The case study should have enough scope for learners to consider how data modelling is used in the decision-making process of a range of areas of the identified organisation, and why the identified data modelling is effective (or not) in meeting the organisation's needs.

Learners could present the evidence in a format of their choosing, but it should give enough detail and scope to demonstrate that they have carried out a thorough investigation. Evidence could be in the form of a written report, or a presentation (with slides and notes) to the company managers, which could be delivered to an audience and videoed. However, a blog or some other form of audio or visual evidence would also be acceptable and would allow learners to develop their creativity, provided the information is communicated in a clear and detailed manner using appropriate language.

For learning aims B and C, learners will need to design and develop a data model to meet the identified requirements of a client. Learners should have a 'client' for whom they are developing the model and whom they will work with throughout the project. The client should give learners a scenario that includes sufficient detail for them to meet the assessment criteria. This should include, for example, a clear description of the nature of the problem, functions that the data model must perform, the required user interface, any identified constraints and the criteria that will be used to measure success. Learners will need to put together a portfolio of evidence to show that they have designed a data model to produce initial spreadsheet designs according to a specification, and that, following review with clients and others, this has been refined to improve its effectiveness.

Evidence for final designs should include detailed worksheet structure diagrams and test plans. Having agreed the final design, learners must go on to develop and test their data model solutions. They must show evidence of reviewing and refining the solutions in the light of issues that arose during development and testing, client feedback and factors that could extend and improve the model. Evidence of refining the model may include annotated screenshots, videos or witness testimony. Learners should also include detailed test logs showing formative and summative testing for functionality and acceptance. Learners should give written or audio/visual evidence to show communication with clients and others throughout the assignment. In addition, learners must write up an evaluation of their own performance during the design and development process (eg planning and recording, evidence of response to outcomes and the impact of their behaviour).

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Getting started

This gives you a starting place for one way of delivering the unit, based around the recommended assessment approach in the specification.

Unit 5: Data Modelling

Introduction

The aim of this unit is to give learners an understanding of the decision-making process and the role that data modelling (in particular, manipulation of complex spreadsheet models) plays in the process.

Learning aim A – Investigate data modelling and how it can be used in the decision-making process

You could begin learning aim A by introducing the overall aim of the unit. Explain that learners will be required to produce two assignments: one that concentrates on learning aim A and one that focuses on learning aims B and C. Learners should be equipped with a range of skills and knowledge before starting the assignments – the assignment should not be used as a vehicle to teach the content.

- You should give learners opportunities to explore the concept of the project lifecycle in a range of contexts, but with particular emphasis on the role that data modelling plays in this. Learners should explore the decision-making processes (A1) applied at the different stages of a project and the factors that impact on the accuracy and outcome of decisions.
- By organising case studies, visits and guest speakers, you can help learners to explore how the features of spreadsheet software can support data modelling, and how this can give a range of alternative options and assist decision making. You should give learners opportunities to apply and develop practical spreadsheet skills to build up a sound understanding of the underlying principles and to analyse how these functions are applied to real-world situations. Learners would benefit from exploring a range of bespoke modelling software (such as Quantrix®) as well as functionality in their generic software (such as Microsoft Excel®).
- Present a range of different models to learners and ask them to analyse them to identify how they fulfil the needs of users and perform specific tasks and/or solve problems. You should give learners enough information to enable them to compare models with similar aims (eg different implementations by different organisations) to see how common tools have been used, and how the different models vary in their ability to meet identified needs. There are many business situations that would benefit from modelling, for example cash flow forecasting to establish short and medium money availability for an organisation. 'What if' scenarios could be used to compare two budgets: costs and projected revenue values could be changed to find the most likely profit scenario for a particular situation. Goal seek could be used to find the optimum interest rate for a loan based on the loan amount, the repayments you can afford and the length of time that the loan is needed.
- Encourage learners to develop their analytical and evaluative skills by setting tasks that require them to explore the features, uses and implications of models and their related decisions within different contexts. Learners should understand how and why different processes are used and be able to select, and justify the selection of, different tools, data sources and data sets to meet identified needs.

Learning aim B – Design a data model to meet client requirements

Learners should be equipped with a range of skills and knowledge before starting the

assignment – the assignment should not be used as a vehicle to teach the content.

- For topics B1 and B2, explain to learners how to use a range of planning documents to identify user requirements and plan the scope of the data model. Documentation for this unit is likely to take the form of project proposals, functional specifications (including required data validation), time plans and worksheet and interface designs, although it may not be limited to this and may include other project planning aspects such as budgeting and testing requirements. Learners should understand the importance of these documents particularly as without them the evaluation process is compromised.
- To develop strong vocational skills, spend time making sure that learners can manage projects effectively. This could include organising meetings with a client, recording outcomes from meetings and other forms of feedback, and adjusting plans and timescales for the project, as appropriate.
- Work with learners to ensure that they develop effective and appropriate communication skills. All project documents and communication with clients should use the appropriate style, tone and content. Equal emphasis should be placed on written and oral communication skills and learners should have opportunities to formally present information, ideas and recommendations to different types of audience.
- Before starting work on the second assignment, you will need to ensure that learners are able to demonstrate strong practical skills in using your chosen data modelling software. Learners will need to understand the scope of the functions and tools available within the chosen software and be able to select and justify the use of these to develop a model to meet a client's needs. Learners should also be encouraged to use digital data sources to independently develop their understanding where their skills are lacking.
- It may be beneficial for learners to also spend some time exploring the concepts of good interface design and how the user interface (UI) of a computer system can have an impact on the user and the functionality of a data modelling solution. Ask learners to consider how an interface should be implemented to meet the needs of a range of users. Reviewing a range of UI examples will help learners to make judgements about what good and bad UIs look like. Learners should also understand that whilst there are best practice techniques for user design, subjectivity also has a part in it.
- Learners will need to consider the outputs from the system and the format that these will take. They should be aware that the format of the data output can affect the usefulness of the system and the quality of the decisions made.

Learning aim C – Develop a data model to meet client requirements

Understanding of this learning aim should flow naturally from learning aim B, and learners will need to be able to apply this understanding to a larger project. Ask learners to explore a range of testing methodologies to develop their understanding of the commonalities and differences between the various methods employed to ensure the quality of a data model.

- Learners should understand how, when and why each is used, and should be able to select and justify the use of different methodologies in their own project. They must appropriately and thoroughly plan and document the testing process and they should understand how this process will contribute to the successful outcome of the project as well as the project evaluation.
- To develop understanding of the testing and review process, give learners access to pre-existing models and ask them to test and review them, in order to identify areas for development and improve the solutions. There are many models online that could be used for this activity and learners should be encouraged to explore a

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range across sectors (such as engineering, business, or medicine as well as those for IT).

- Help to develop learners' evaluative skills. They should be able to use the outcomes of testing and review to evaluate the quality of data models (and their own performance, as appropriate) against project requirements and client expectations.
- Work with learners to ensure effective and appropriate presentation skills. All project documents and client communication should use the appropriate style, tone and content. Learners should also be shown how a range of communication styles and tools can be used in different combinations and contexts (such as giving out handouts containing acronyms for non-technical staff in a presentation).
- The assignment should have a valid, vocational context. For the duration of the project, ask learners to work with a 'client' who will give them the operating requirements, set expectations and negotiate the timescales.
- The 'client', where possible, should be a real-world client with whom the learner can engage. While the project will be simulated (ie it will not be a live project), engaging with local employers to give learners a vocational setting would be invaluable. Remember, it is likely that you will have ex-learners who may well have remained local and who will be in different places in their careers. Social media is useful for reaching out. If real-world clients are not a possibility, ask another adult to adopt the role of client. Other learners should not fulfil this role, although they could be test users. It is important that the client has a sound knowledge of the project and the related computing requirements.
- It will benefit learners if they maintain a diary or take notes as they complete the various practical activities in the lessons relating to this learning aim. They should also note the comments that their peers make when they give feedback.
- Ensure that learners understand how to fulfil the assessment criteria for the pass, merit and distinction grades.

Details of links to other BTEC units and qualifications, and to other relevant units/qualifications

Pearson BTEC Level 3 Nationals in IT (NQF):

- *Unit 1: Information Technology Systems*

Resources

In addition to the resources listed below, publishers are likely to produce Pearson-endorsed textbooks that support this unit of the BTEC Nationals in IT. Check the Pearson website (http://qualifications.pearson.com/en/support/published-resources.html) for more information as titles achieve endorsement.

Websites

- www.eusprig.org/index.htm
  European Spreadsheet Risks Interest Group – has a range of skills training videos and academic papers on development of spreadsheets and data models.
- http://epublications.bond.edu.au/ejsie/
  Bond University – online/electronic journal on the role of spreadsheets in education.
- http://eusesconsortium.org/
  End Users Shaping Effective Software consortium – academic research and links to academic materials on end user software development including human user interface (Human-Computer Interaction) design.

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